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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/427,802	10/27/1999	BAHRAM GHAFARZADEH KERMANI	KERMANI-14	3789

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EXAMINER

HIRL, JOSEPH P

ART UNIT	PAPER NUMBER
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2121

DATE MAILED: 10/22/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/427,802

Applicant(s)

KERMANI, BAHRAM
GHAFFARZADEH

Examiner

Joseph P. Hirl

Art Unit

2121

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 August 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to an AMENDMENT entered August 5, 2002 for the patent application 09/427,802 filed on October 27, 1999.
2. The first Office Action of February 28, 2002 is fully incorporated into this Final Office Action by reference.

Status of Claims

3. Claim 2 was amended. Claims 1-20 are pending.

Response to Arguments

4. The rejections of Claims 2, 16, 17, 19, and 20 under 35 U.S.C. 112, first paragraph, are withdrawn.
5. Applicant's arguments filed on August 5, 2002 related to Claims 1 - 20 have been fully considered but are not persuasive.

In reference to Applicant's argument:

The present invention has two independent claims: claim 1 and claim 9. The Examiner has rejected each of these claims, including certain of the claims depending from these independent claims, based upon the Chidambaran et al. reference. This rejection is respectfully traversed. As noted above, the Chidambaran et al. reference is related to genetic programming. Further, as admitted by the Examiner, the Chidambaran et al. reference teaches that the evolutionary process for generating the computer program

Art Unit: 2121

is repeated "for a pre-specified number of times". In other words, a number of generations to evolve is selected ahead of time, and then when this number is reached, the process is completed.

By contrast, the present invention, as specifically claimed in both independent claims 1 and 9, involves the use of genetic algorithms to improve the fitness function of rules in a random rule set in a fuzzy logic system. The evolutionary process continues not for a finite, pre-determined number of generations; instead, it continues until the fitness function of the rules cannot be further improved, i.e., becomes substantially constant, indicating that it has reached a plateau. Independent claims 1 and 9 each specifically recite these features not taught or suggested by Chidambaran et al. (e.g., Claim 1: "...evolving said random rules using a genetic algorithm to improve the fitness function of said rules in said random rule set until the overall fitness function of said rules plateaus, thereby generating an optimized rule ..."). As a result, an optimized rule is generated.

Examiner's response:

The Examiner interprets the claims in the broadest reasonable sense. The claims establish the metes and bounds of the invention. To one of ordinary skill in the art, an algorithm is a procedure for solving a mathematical problem in a finite number of steps that frequently involves repetition of an operation. A computer program is also an algorithm. Chidambaran's Genetic Programming as described on page 199 performs as a Genetic Algorithm.

To one of ordinary skill in the art, an algorithm that involves iteration will be done for some N times to satisfy some criteria. N is axiomatically finite. The alternative of setting N at infinity carries no useful value since it can only be achieved in infinite time. Typically, problems of the type identified in the disclosure are not deterministic and do not have unique solutions. Consequently, when one searches for an optimized rule, the options even at a plateau (level in only trivial situations) are multiple and thereby demand a predetermined limiting N. The obvious alternative is unacceptable (N unlimited) since as an example, a dual pole plateau would offer two solutions within the framework of a minimizing/maximizing equation and the algorithm would oscillate to infinity. By the nature of the situation, the Applicant has a predetermined limiting N

integrated in the evolving process of random rules. Operating with finite N (pre-specified number of times...generations), Chidambaran identifies the most fit or optimized solution (**Chidambaran**, page 199, line 28) without having to go to infinite time.

The bodies of claims 1 and 9 do not address a fuzzy logic system.

The Examiner observes that the Applicant in the above reference states: "The evolutionary process continues not for a finite, pre-determined number of generations;..." The alternative to a non-finite situation is infinity which of course would cause this application to have no utility and be disqualified under 35 U.S.C. 101.

Chidambaran (page 199, lines 25 – 28) states: "The above steps are repeated for a pre-specified number of times (generations). Evolutionary pressure in the form of fitness-related selection combined with the crossover operator eventually produce populations of highly fit individuals. We keep track of the most fit individual found throughout this process and define it to be the solution to the problem.

In reference to Applicant's argument:

The development disclosed in the Chidambaran et al. reference cannot perform this function. First, its purpose is to generate a computer program, not to improve the fitness function of rules in a random rule set of a fuzzy logic system. Further, once the predetermined number of generations has elapsed, the process of Chidambaran et al. terminates, regardless as to whether or not any plateauing has taken place and, thus, regardless as to whether or not the computer program being generated is "optimized".

To summarize, the present claimed invention specifically claims the use of a genetic algorithm; the Chidambaran et al. reference is specifically limited to genetic programming. Further, the genetic algorithms of the present invention are continually repeated until a plateau is reached, which results in an optimized rule set; the development taught in the Chidambaran et al. reference, simply evolves for a predetermined number of generations, regardless of the outcome. For these reasons alone, the present claimed invention as claimed in claims 1 and 9, and all claims depending there from (claims 2-8 and 10-20), patentably define over the prior art and are in condition for allowance.

Examiner's response:

Again, the bodies of claims 1 and 9 do not address a fuzzy logic system.

Chidambaran states (page 199, lines 11 – 13): "Every individual in the population is evaluated and assigned a fitness measure according to how well it solves the problem in question. In our case we assign higher fitness to individuals which exhibit smaller mispricing for the training data set."

Again to one of ordinary skill in the art, problems of the type discussed typically have local optimums and corresponding sub-optimum rule sets and not necessarily a unique set on a quasi plateau. Chidambaran deals with this problem by stating (page 199, lines 25 – 28): "Evolutionary pressure in the form of fitness-related selection combines with the crossover operator eventually produce populations of highly fit individuals. We keep track of the most fit individual found throughout this process and define it to be the solution to the problem." This is Chidambaran's rules plateaus and the respective optimized rule. The statement by Chidambaran regarding iteration for a pre-specified number of iterations where the iterations N is not defined does not disqualify Chidambaran's art since the Applicant by necessity also will be using a prespecified N.

In reference to Applicant's argument:

First, these claims depend from independent claims 1 and 9 which, as noted above, patentably define over the prior art. The addition of the Hung reference does not render these claims obvious. The Examiner asserts that U.S. Patent No. 5,727,130 to Hung teaches evolving features of random rules at column 123, lines 6-10. This is incorrect. The cited portion of Hung teaches the production of chromosomes representing "input membership functions and rules for a fuzzy logic system." Applicant admits that Hung

Art Unit: 2121

teaches the evolution of fuzzy rules using GA's, see specification, page 5, lines 11-19. As further set forth therein, however, Hung does not teach or suggest the evolution of "variables, such as features, qualifiers, and operators ...".

Each of claims 3-6 and 10-13 specifically claim the evolution of features, qualifiers and/or operators. Thus, Hung fails to teach or suggest the recited elements of claims 3-6 and 10-13. Accordingly, these claims patentably define over both Chidambaran et al. and Hung, either taken alone or in combination.

Examiner's response:

To one of ordinary skill in the art, a "plurality of chromosomes" (Hung, col 123, lines 6 – 7) is equivalent to a plurality of rules as is acknowledged by the Applicant in the Amendment dated August 5, 2002 (page 4, lines 12 – 13).

To one of ordinary skill in the art, a parameter is an independent variable. Further, such independent variable can take on any characteristic of the system such as features, qualifiers, operators or any other system factor. Hung teaches the evolution of variables such as features, qualifiers and operators...such reference merely describes system variables...(Hung, col 123, lines 1 – 30). Further and as confirmed by the Applicant above, Hung's art teaches the evolution of fuzzy rules using GA's .

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Claims 1,2, 7 – 9, 14 - 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Chidambaran et al (IEEE 98TH8367, referred to as **Chidambaran**).

Claim 1

Chidambaran anticipates generating a pool of random rules having a fitness

function and storing said random rules (**Chidambaran**, page 199, lines 6 – 9); evolving said random rules using a genetic algorithm to improve the fitness function of said rules in said random rule set until the overall fitness function of said rules plateaus, thereby generating an optimized rule (**Chidambaran**, page 199, lines 25 – 27); and storing said optimized rule in an optimized rule storage area, said rules stored in said optimized rule storage area comprising said optimized rule set (**Chidambaran**, page 199, lines 27 – 28).

Claim 2

Chidambaran anticipates checking said optimized rule storage area to determine if it contains any optimized rules (**Chidambaran**, page 200, lines 3 – 4); and using any optimized rules contained in said optimized rule storage area when generating said pool of random rules (**Chidambaran**, page 200, lines 3 – 4).

Claim 7

Chidambaran anticipates said generating, evolving, and storing steps are repeated until a predetermined number of rules are stored as said optimized rule set (**Chidambaran**, page 202, lines 18 – 20).

Claim 8

Chidambaran anticipates said repeating of said steps occurs on a real-time basis (**Chidambaran**, page 200, lines 5 – 7).

Claim 9

Chidambaran anticipates generating a pool of random rules having a fitness function and storing said random rule (**Chidambaran**, page 199, lines 6 – 9); evolving

Art Unit: 2121

said random rules using a genetic algorithm to improve the fitness function of said rules in said random rule set until the overall fitness function of said rules plateaus, thereby generating an optimized rule (**Chidambaran**, page 199, lines 25 – 27); storing said optimized rule in an optimized rule storage area, said rules stored in said optimized rule storage area comprising said optimized rule set; applying a stock market data set to said optimized rule set (**Chidambaran**, page 199, lines 27 – 28); and outputting a stock market analysis result based on the application of said stock market data set to said optimized rule set (**Chidambaran**, page 197, lines 13 – 15).

Claim 14

Chidambaran anticipates said generating, evolving, and storing steps are repeated until a predetermined number of rules are stored as said optimized rule set (**Chidambaran**, page 202, lines 18 – 20).

Claim 15

Chidambaran anticipates said repeating of said steps occurs on a real-time basis (**Chidambaran**, page 200, lines 5 – 7).

Claim 16

Chidambaran anticipates said stock market data set comprises data regarding a particular stock choice (**Chidambaran**, page 202, lines 18 – 20).

Claim 17

Chidambaran anticipates said stock market data set comprises data regarding a particular stock market (**Chidambaran**, page 202, lines 18 – 20).

Claim 18

Chidambaran anticipates said stock market data set comprises data regarding comprising a particular segment of stocks (**Chidambaran**, page 202, lines 18 – 20).

Claim 19

Chidambaran anticipates said stock market data set comprises data regarding comprising mutual funds (**Chidambaran**, page 201, lines 4 – 12).

Claim 20

Chidambaran anticipates said stock market data set comprises data regarding comprising futures (**Chidambaran**, page 197, lines 13 – 15).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3 – 6 and 10 – 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chidambaran et al in view of Hung (IEEE 98TH8367, referred to as **Chidambaran**; U. S. Patent 5,727,130, referred to as **Hung**).

Claim 3

Chidambaran does not teach said evolving step comprises evolving the features of said random rules. However, Hung does teach said evolving step comprises evolving the features of said random rules (**Hung**, col 123, lines 6 – 10). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Hung's interface of genetic algorithms with fuzzy logic systems to eliminate manually building fuzzy systems (Hung, col 3, lines 18 – 20).

Claim 4

Chidambaran does not teach said evolving step comprises evolving the qualifiers of said random rules. However, Hung does teach said evolving step comprises evolving the qualifiers of said random rules (**Hung**, col 123, lines 6 – 10). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Hung's interface of genetic algorithms with fuzzy logic systems to eliminate manually building fuzzy systems (Hung, col 3, lines 18 – 20).

Claim 5

Chidambaran does not teach said evolving step comprises evolving the operators of said random rules. However, Hung teaches said evolving step comprises evolving the operators of said random rules (**Hung**, col 123, lines 6 – 10). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Hung's interface of genetic algorithms with fuzzy logic systems to eliminate manually building fuzzy systems (Hung, col 3, lines 18 – 20).

Claim 6

Chidambaran does not teach said evolving step comprises evolving the features, cases, qualifiers, and operators of said random rules. However, Hung teaches said evolving step comprises evolving the features, cases, qualifiers, and operators of said random rules (**Hung**, col 123, lines 6 – 10). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Hung's interface of genetic algorithms with fuzzy logic systems to eliminate manually building fuzzy systems (Hung, col 3, lines 18 – 20).

Claim 10

Chidambaran does not teach said evolving step comprises evolving the features of said random rules. However, Hung teaches said evolving step comprises evolving the features of said random rules (**Hung**, col 123, lines 6 – 10). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Hung's interface of genetic algorithms with fuzzy logic systems to eliminate manually building fuzzy systems (Hung, col 3, lines 18 – 20).

Claim 11

Chidambaran does not teach said evolving step comprises evolving the qualifiers of said random rules. However, Hung teaches said evolving step comprises evolving the qualifiers of said random rules (**Hung**, col 123, lines 6 – 10). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Hung's interface of genetic algorithms with fuzzy logic systems to eliminate manually building fuzzy systems (Hung, col 3, lines 18 – 20).

Claim 12

Chidambaran does not teach said evolving step comprises evolving the operators of said random rules. However, Hung teaches said evolving step comprises evolving the operators of said random rules (**Hung**, col 123, lines 6 – 10). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Hung's interface of genetic algorithms with fuzzy logic systems to eliminate manually building fuzzy systems (Hung, col 3, lines 18 – 20).

Claim 13

Chidambaran does not teach said evolving step comprises evolving the features, cases, qualifiers, and operators of said random rules. However, Hung teaches said evolving step comprises evolving the features, cases, qualifiers, and operators of said random rules (**Hung**, col 123, lines 6 – 10). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Hung's interface of genetic algorithms with fuzzy logic systems to eliminate manually building fuzzy systems (Hung, col 3, lines 18 – 20).

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence Information

9. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner, Joseph P. Hirl, whose telephone number is (703) 305-1668. The Examiner can be reached on Monday – Thursday from 6:00 a.m. to 4:30 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, John Follansbee can be reached at (703) 305-8498.

Any response to this office action should be mailed to:

Commissioner of Patents and Trademarks,

Application/Control Number: 09/427,802
Art Unit: 2121

Page 14

Washington, D. C. 20231;

or faxed to:

(703) 746-7239 (for formal communications intended for entry);

or faxed to:

(703) 746-7240 (for informal or draft communications with notation of
"Proposed" or "Draft").

Hand-delivered responses should be brought to:

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Crystal Park II,
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Joseph P. Hirt



October 18, 2002



JOHN A. FOLLANSBEE
PRIMARY EXAMINER